Landsat 7 Mission Operations

Terry Arvidson
Lockheed Martin Missiles and Space
Senior System Engineer
Attached to MOC and to Science Office

John Gasch
Computer Sciences Corporation
MOC Software Developer

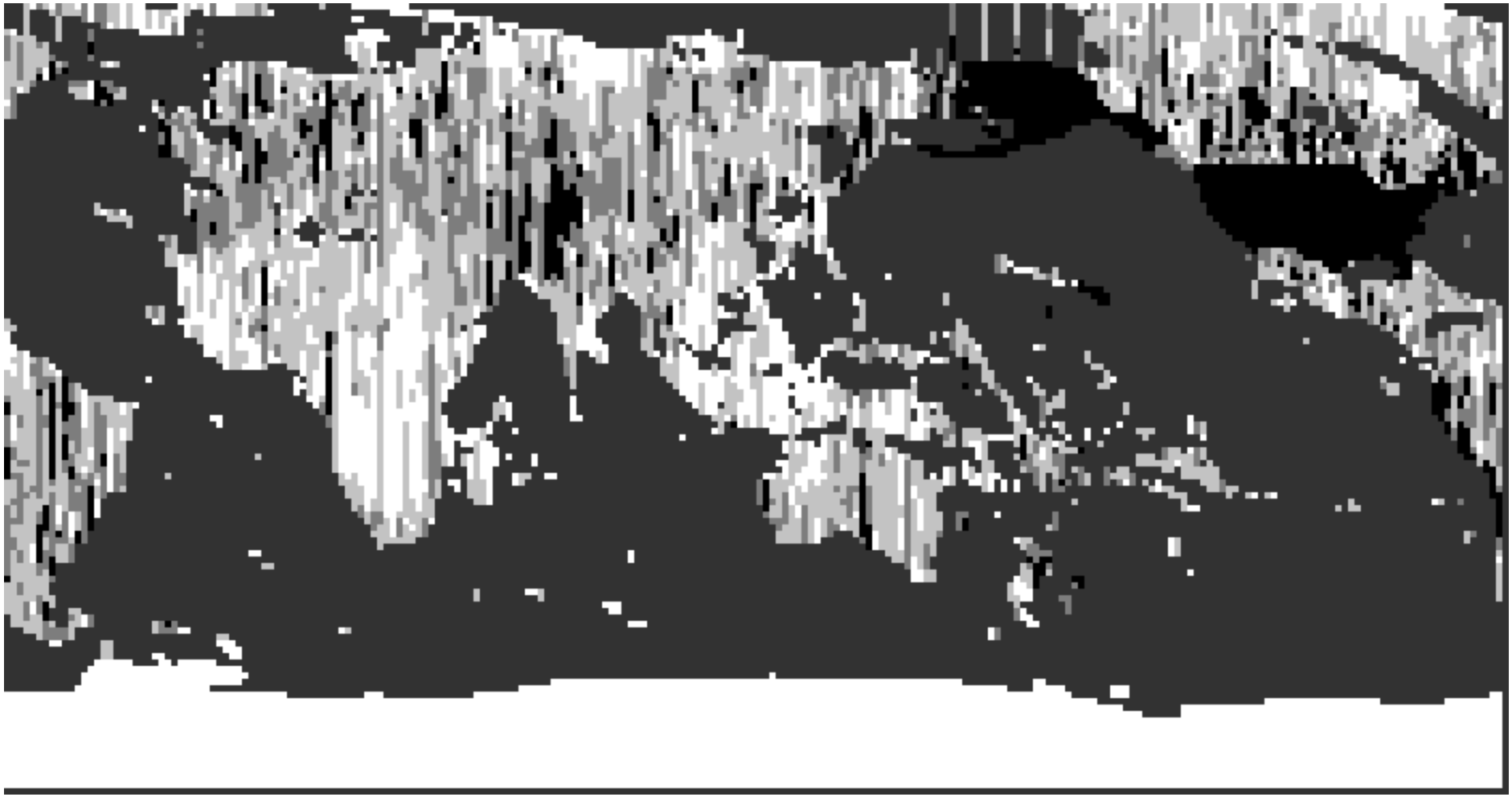
Topics to be addressed today:

- **Summary of First Four Cycles of Operations**
- **IGS Scheduling History for First Four Cycles**
- **Status of IGS Interfaces with MOC and DAAC**

Summary of First Four Cycles of Operations

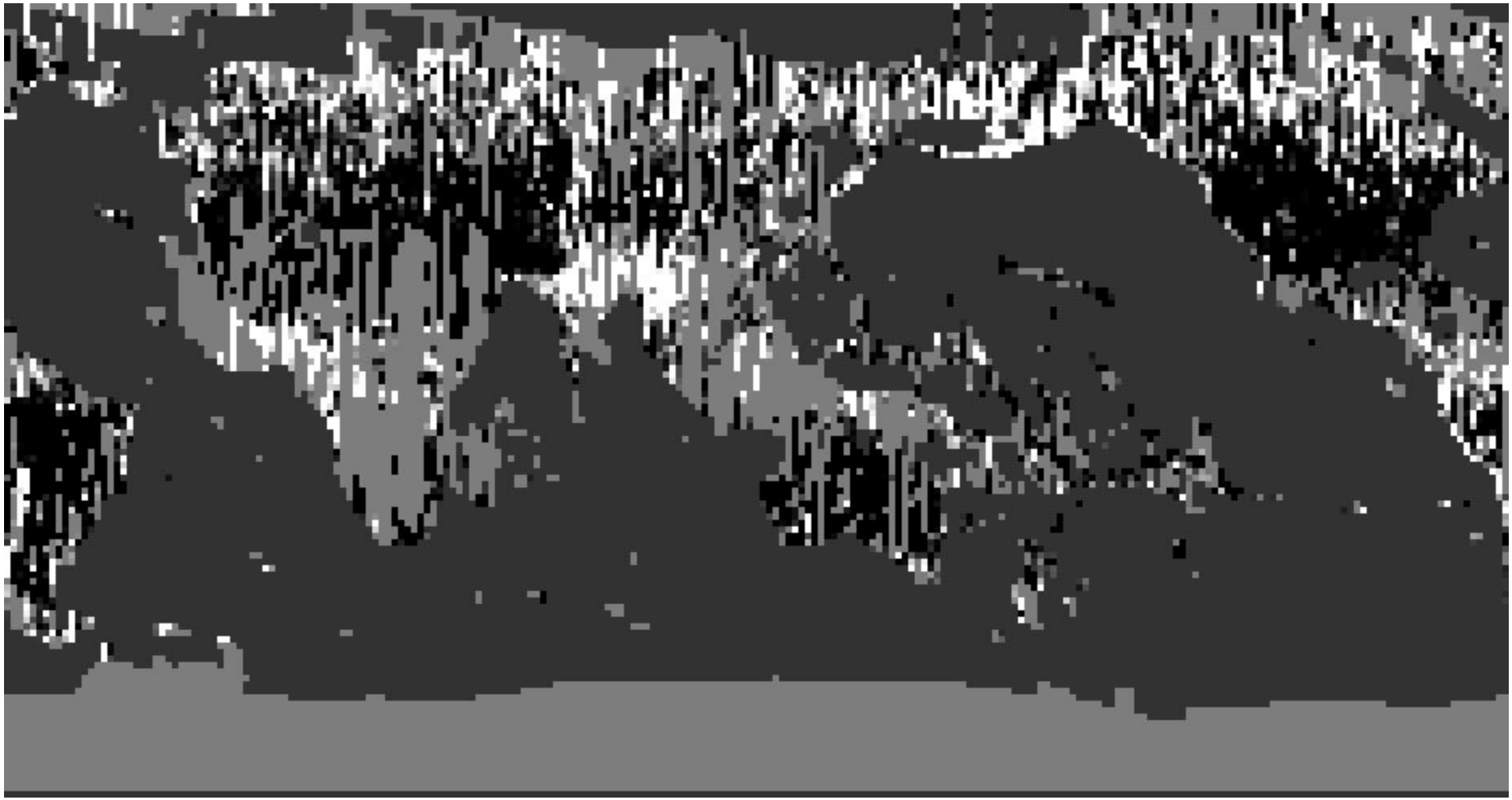
- Cycle 1 (days 180-196, 6/29-7/15) not included in following charts
  - Was practice cycle, acquisition levels were forced to be high
  - Some startup problems at stations and at archive
- Cycles 2 thru 4 are reported in the following charts
  - Cycle 2 (days 196-212, 7/15-7/31)
  - Cycle 3 (days 212-228, 7/31-8/16)
  - Cycle 4 (days 228-244, 8/16-9/1)

Density Of US Acquisitions During Cycles 2 Thru 4



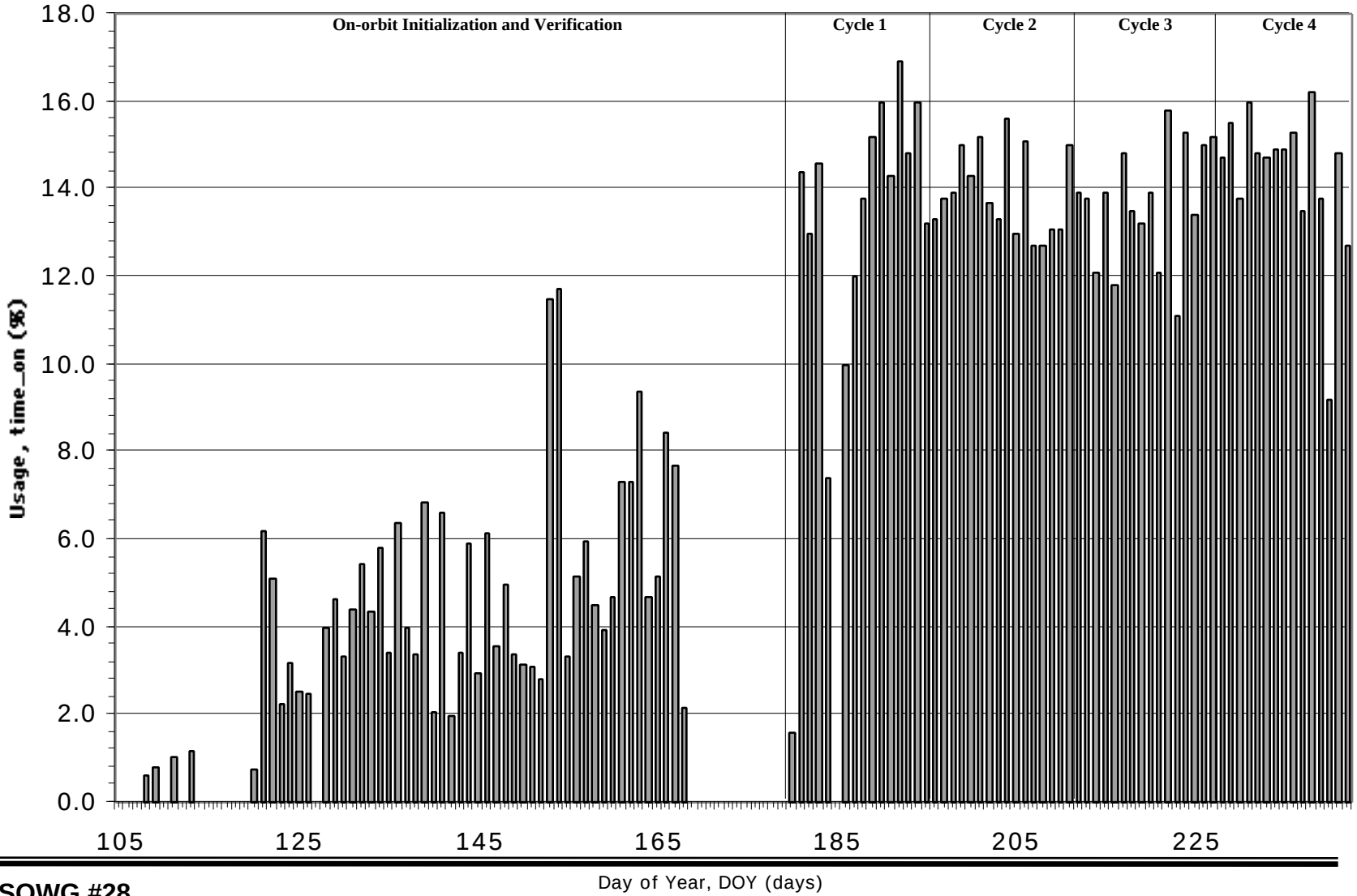
 # Cycles acquired: 0 = White, 1 = Yellow, 2 = Green, 3 = Black (Water = Blue)

Best Cloud Cover Score Achieved During Cycles 2 Thru 4



Best ACCA Score Received: 0 - 10% = Black, 11 - 59% = Grays, 61 - 100% = White (Land = Green)

% Utilization Of ETM+ Since Launch



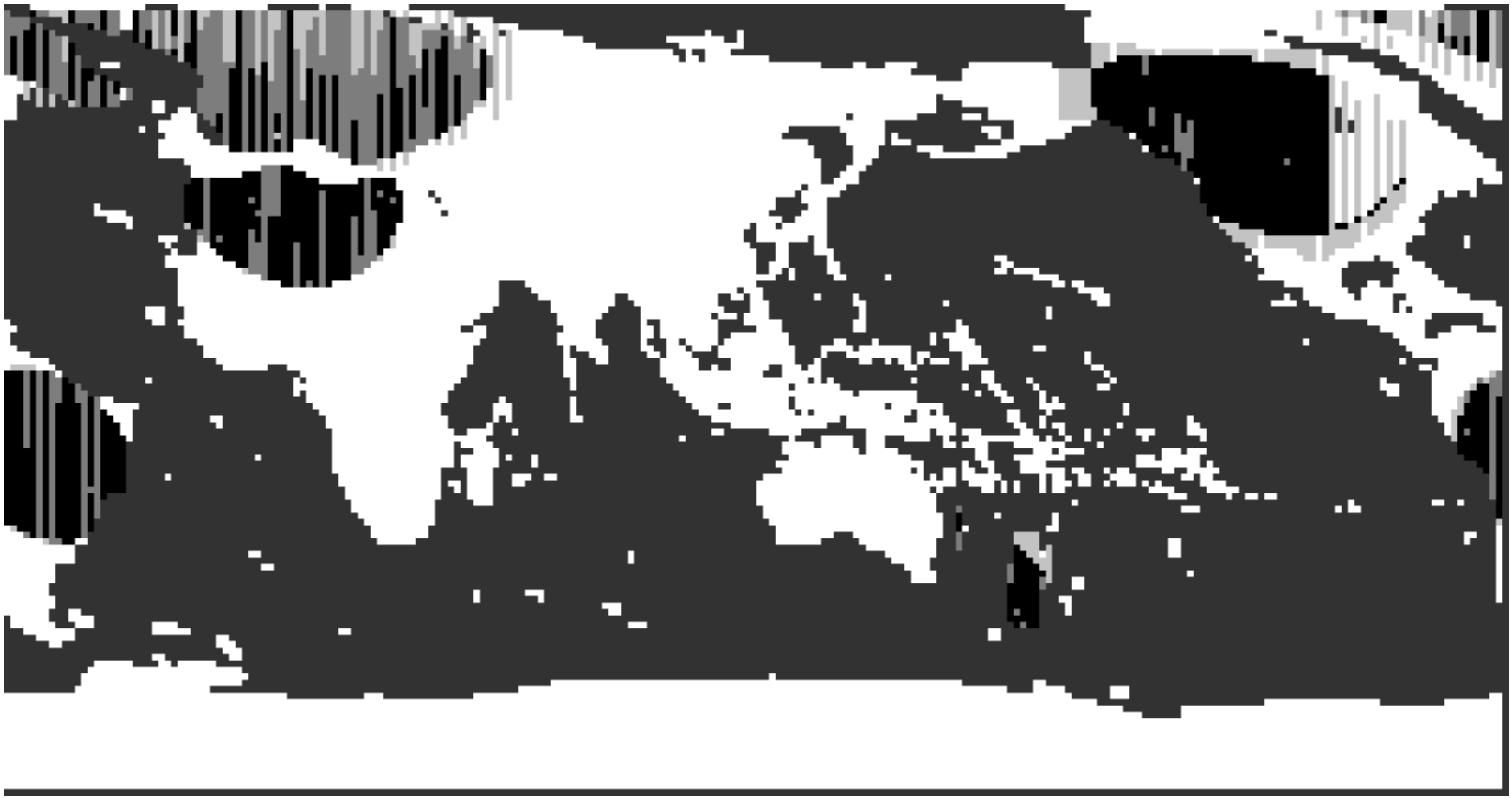
IGS Scheduling History for First Four Cycles

- **Cycle 1 (days 180-196, 6/29-7/15) not included in following charts**
  - **Was practice cycle, acquisition levels were forced to be high by adding extra stations and extra downlinks**
  - **Stations didn't start at same time, some startup problems at stations**
- **Cycles 2 thru 4 are reported in the following charts**
  - **Cycle 2 (days 196-212, 7/15-7/31)**
  - **Cycle 3 (days 212-228, 7/31-8/16)**
  - **Cycle 4 (days 228-244, 8/16-9/1)**

ASA, COA, GNC, NSG Acquisitions

# of Acquisitions: 1 = Yellow, 2 = Green, 3 = Black

CUB, FUI, HOA, KIS, PAC Acquisitions



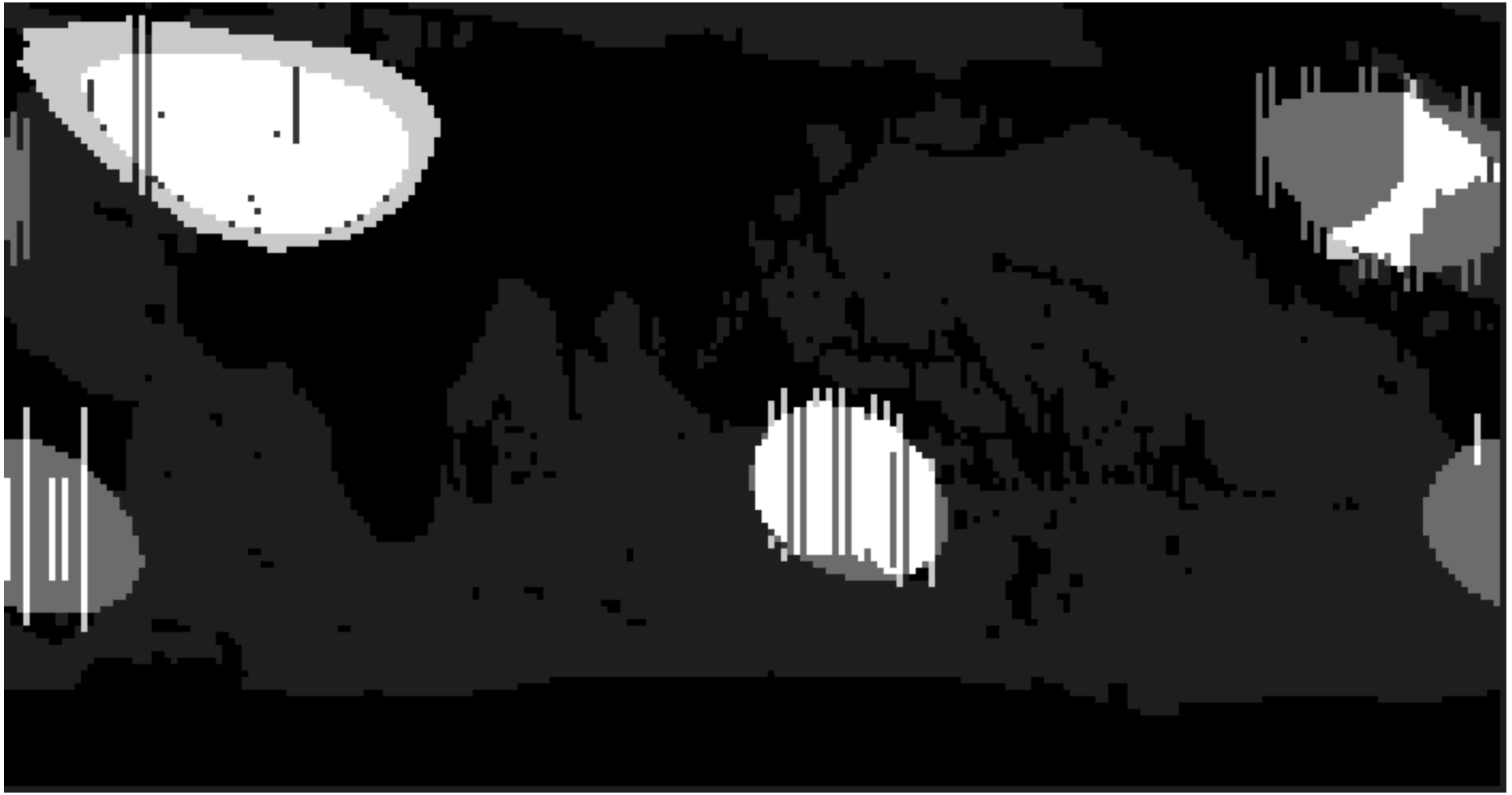
# of Acquisitions: 1 = Yellow, 2 = Green, 3 = Black

Scenes Requested, Scheduled, Rejected During Cycles 2 Thru 4

- **Plots showing for each IGS:**
  - **Scenes unavailable - that is, outside the acquisition circle**
  - **Scenes within the acquisition circle**
  - **Scenes requested and scheduled**
  - **Scenes requested and rejected**

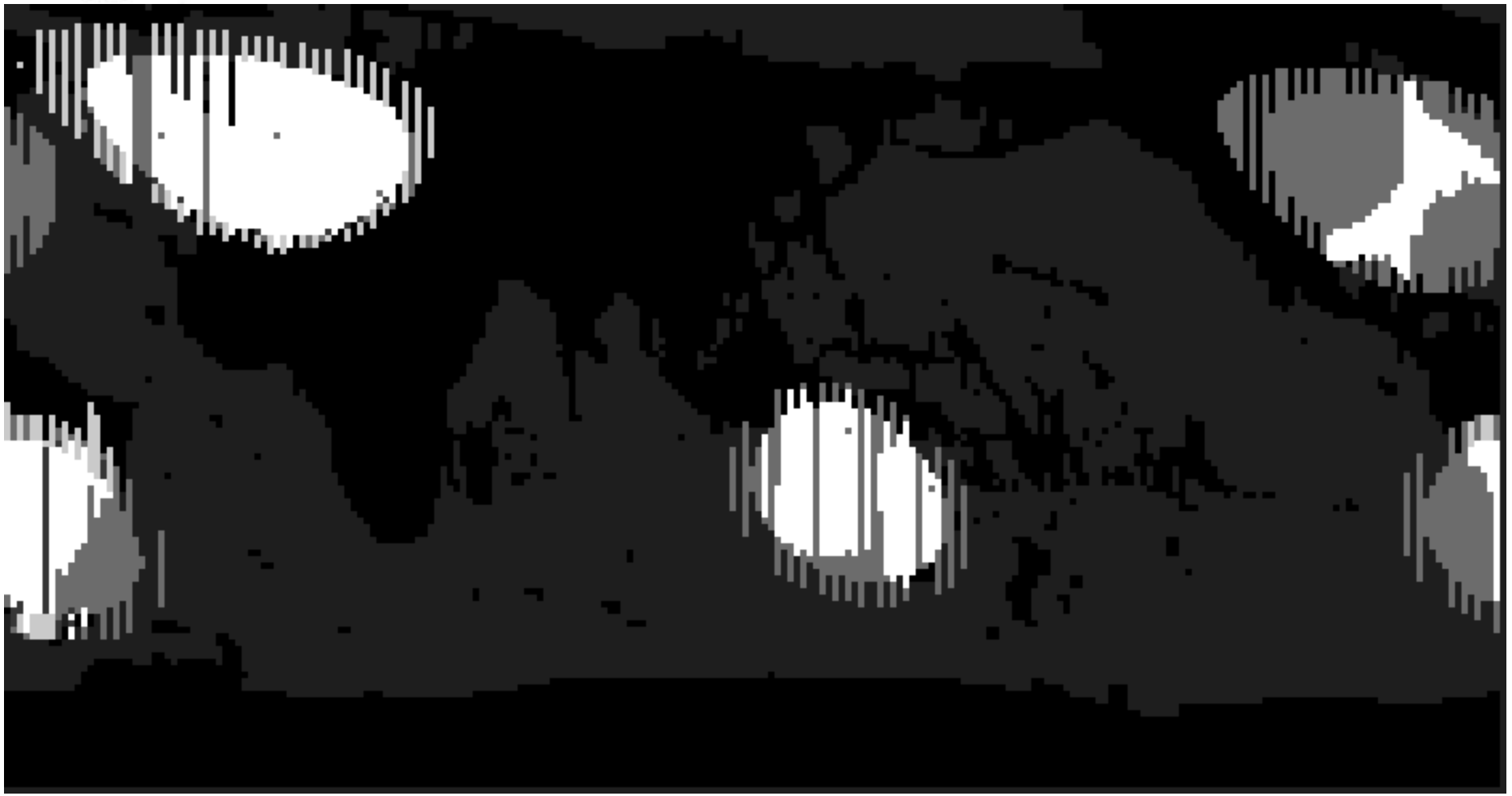
- **Note in cycle 3 and 4:**
  - **Some acquisition circles were accidentally returned to 5˚ on 8/12; were returned to 0˚ on 9/9**
  - **Some station antenna masks were accidentally included in the calculation of the acquisition circle on 8/12; effect was to generate two in-view times, so smaller one was deleted manually by planners; corrected on 8/19**

Cycle 2 Requests From ASA, COA, GNC, NSG



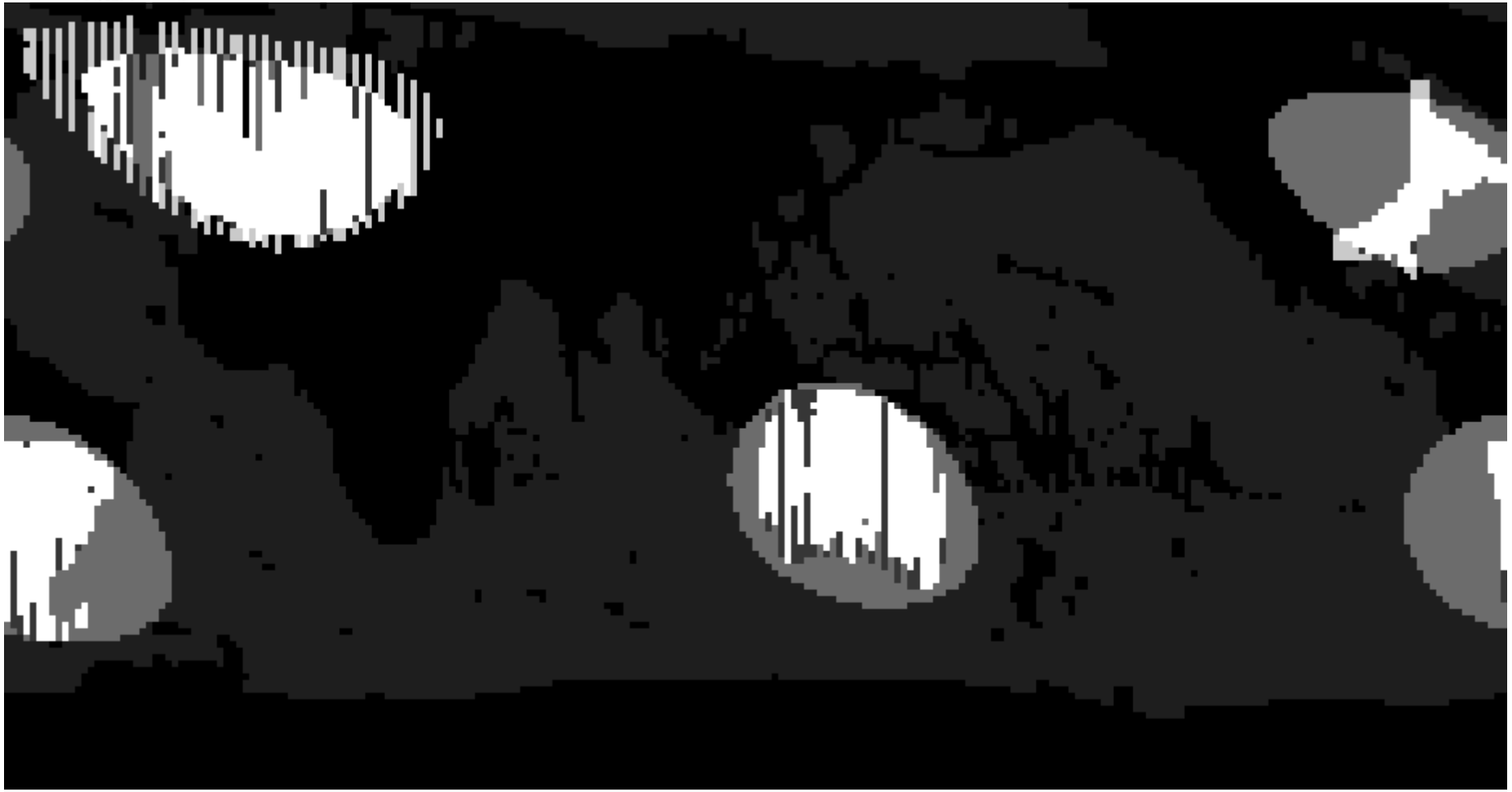
Unavailable = Yellow, Acquisition circle = Green, Requested/Scheduled = White, Requested/Rejected = Red (Land = Black)

Cycle 3 Requests From ASA, COA, GNC, NSG



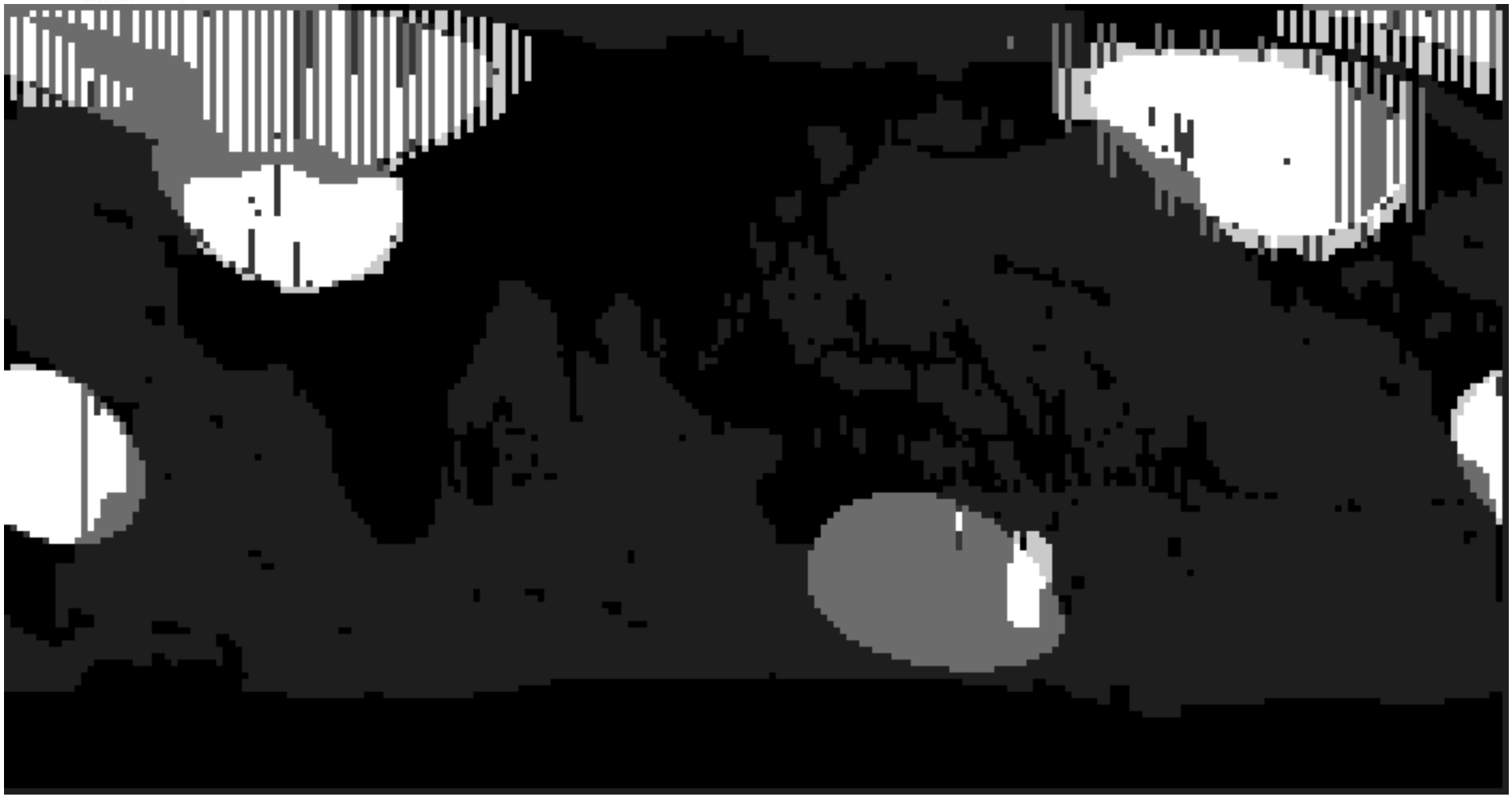
Unavailable = Yellow, Acquisition circle = Green, Requested/Scheduled = White, Requested/Rejected = Red (Land = Black)

Cycle 4 Requests From ASA, COA, GNC, NSG



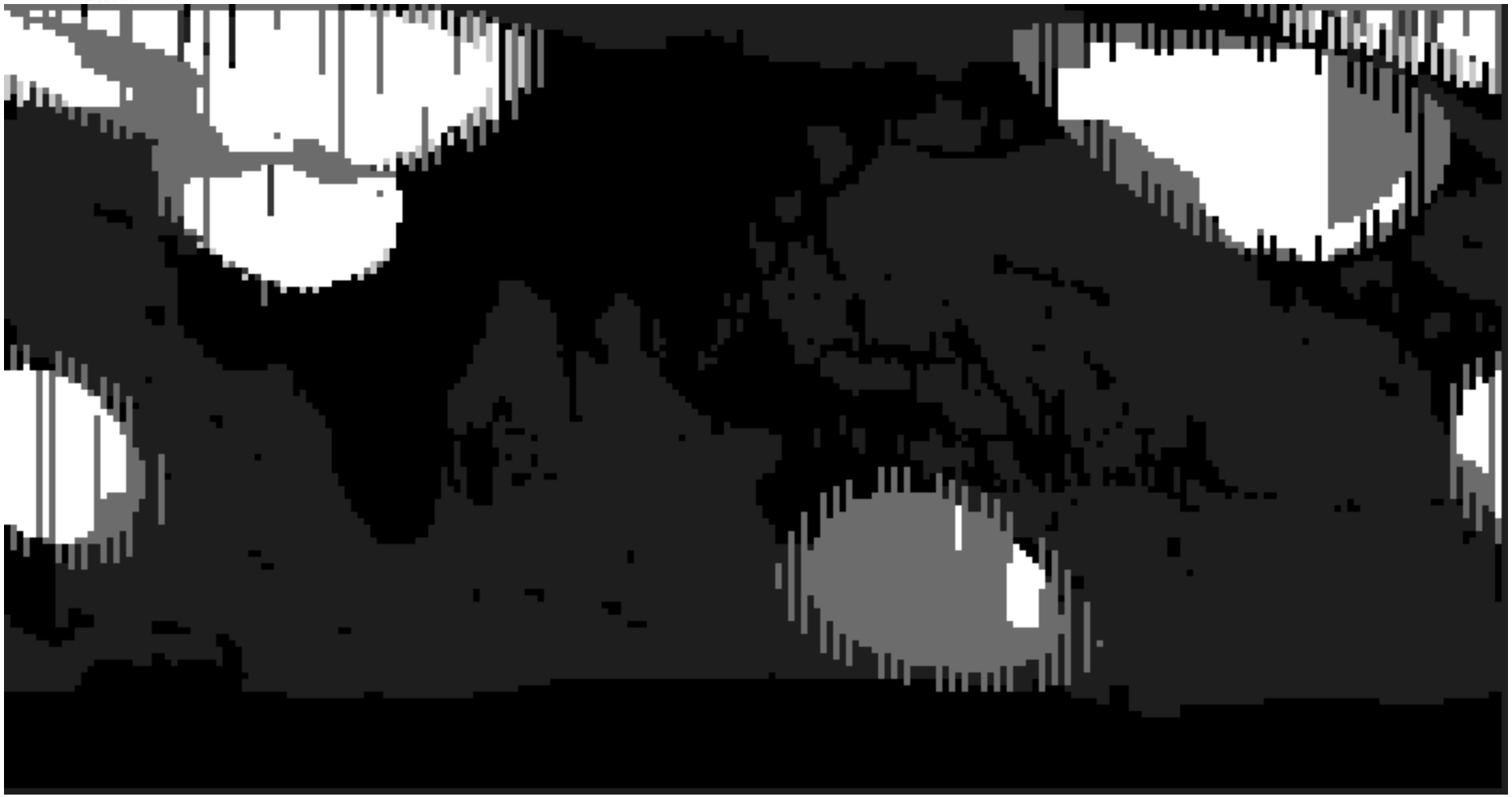
Unavailable = Yellow, Acquisition circle = Green, Requested/Scheduled = White, Requested/Rejected = Red (Land = Black)

Cycle 2 Requests From CUB, FUI, HOA, KIS, PAC



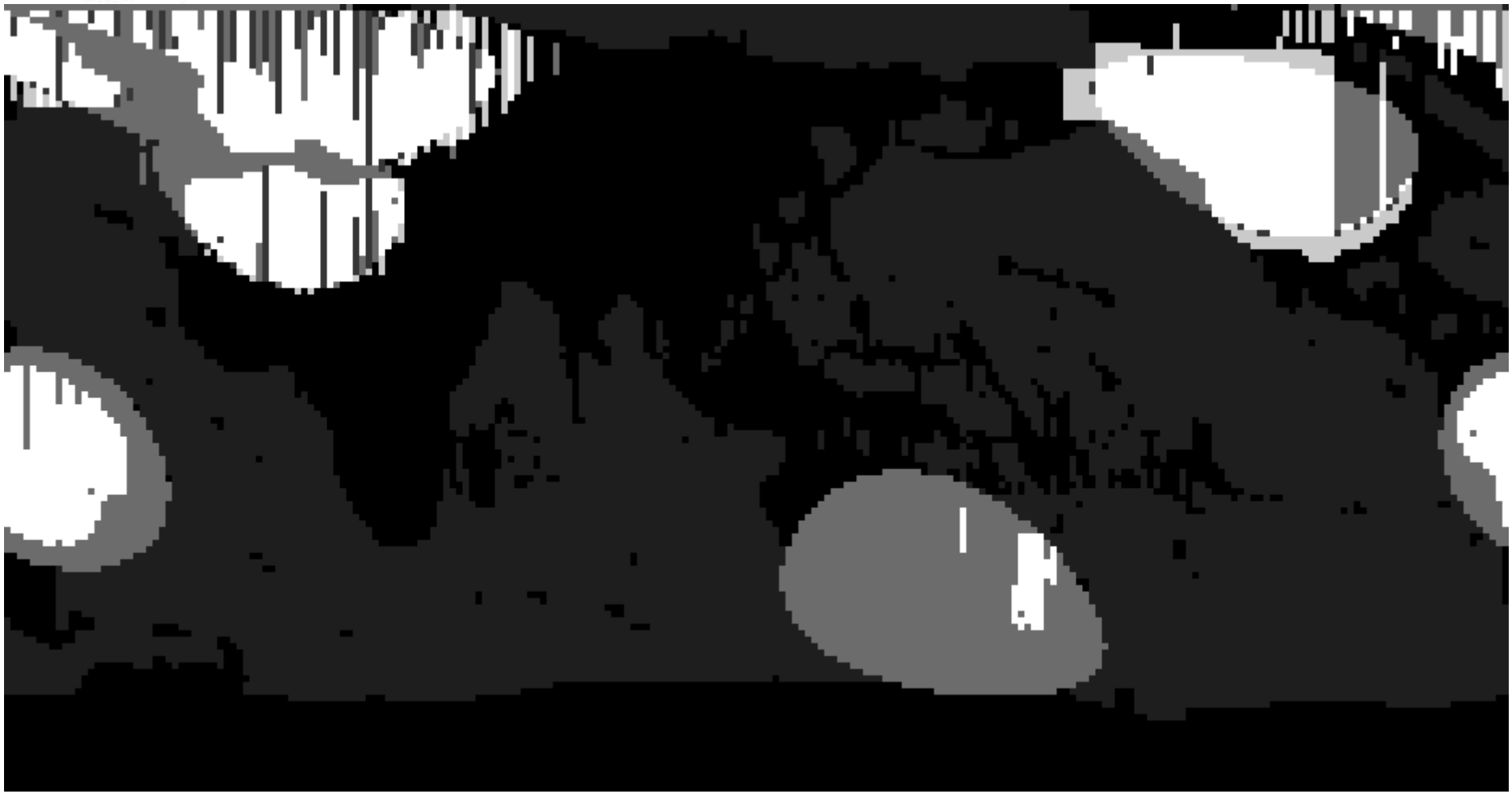
Unavailable = Yellow, Acquisition circle = Green, Requested/Scheduled = White, Requested/Rejected = Red (Land = Black)

Cycle 3 Requests From CUB, FUI, HOA, KIS, PAC



Unavailable = Yellow, Acquisition circle = Green, Requested/Scheduled = White, Requested/Rejected = Red (Land = Black)

Cycle 4 Requests From CUB, FUI, HOA, KIS, PAC



Unavailable = Yellow, Acquisition circle = Green, Requested/Scheduled = White, Requested/Rejected = Red (Land = Black)

Status of Host Nation Definitions

- **ASA - Australia**
- **BJC - Peoples' Republic of China**
- **BKT - Thailand**
- **COA - Argentina**
- **CUB - Brazil**
- **FUI - Italy**
- **GNC -Canada**
- **HAJ - Japan**
- ➡ **HOA - New Zealand (changed from Australia per LTWG #7)**
- **HIJ - Japan**
- **KIS - Sweden**
- **KUJ - Japan**
- **LBG - Gabon**
- **NSG - ESA (Andorra, Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Germany, Liechtenstein, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK)**
- **PAC - Canada**

Reasons For Rejecting IGS Requests

- **Active rejection by the scheduler**
  - **Request is ingested, considered, and denied during scheduling**
  - **These include:**
    - **Antenna conflict (between Svalbard and FUI)**
    - **Short term duty cycle (34 minutes max in one-orbit window)**
    - **Mid term duty cycle (52 minutes max in two-orbit window)**
    - **Long term duty cycle (240 minutes max in 24-hour window)**
- **Passive rejection by the scheduler**
  - **Request is not ingested or considered by the scheduler**
  - **These include:**
    - **Universal block (command load problem, maneuver period, solar eclipse period)**
    - **Request received too late from IGS**
    - **Request minimum gap set such that request not considered active**

% Requests Scheduled Of Host Nation Scenes

Station	Requested Scenes	Scenes Considered During Scheduling	Scenes Scheduled Successfully	% Requested Scenes that were Scheduled	Scenes Not Scheduled (Active + Passive Rejects)	Scenes Actively Rejected during Scheduling	% Requested Scenes that were Active Rejects	% Requested Scenes that were Considered and not Rejected
	RS	C	SS	= SS / RS	NS = RS-SS	AR	= AR / C	= SS / C
ASA	471	310	278	59.0%	193	32	10.3%	89.7%
BJC	3	3	3	100.0%	0	0	.0%	100.0%
COA	285	279	278	97.5%	7	1	.4%	99.6%
CUB	358	328	327	91.3%	31	1	.3%	99.7%
FUI	1228	1218	1196	97.4%	32	20	1.6%	98.4%
GNC	273	266	264	96.7%	9	2	.8%	99.2%
HOA	146	145	138	94.5%	8	7	4.8%	95.2%
KIS	2327	2289	2126	91.4%	201	163	7.1%	92.9%
NSG	2722	2710	2694	99.0%	28	18	.7%	99.3%
PAC	580	564	564	97.2%	16	0	.0%	100.0%

% Requests Scheduled Of Non-Host Nation Scenes

Station	Requested Scenes	Scenes Considered During Scheduling	Scenes Scheduled Successfully	% Requested Scenes that were Scheduled	Scenes Not Scheduled (Active + Passive Rejects)	Scenes Actively Rejected during Scheduling	% Requested Scenes that were Active Rejects	% Requested Scenes that were Considered and not Rejected
	RS	C	SS	= SS / RS	NS = RS-SS	AR	= AR / C	= SS / C
ASA	650	650	638	98.2%	12	12	1.8%	98.2%
BJC	23	23	23	100.0%	0	0	.0%	100.0%
COA	228	228	227	99.6%	1	1	.4%	99.6%
CUB	651	651	644	98.9%	7	7	1.1%	98.9%
FUI	104	104	92	88.5%	12	11	10.6%	89.4%
GNC	265	265	263	99.2%	2	2	.8%	99.2%
HOA	10	10	10	100.0%	0	0	.0%	100.0%
KIS	110	110	110	100.0%	0	0	.0%	100.0%
NSG	86	86	86	100.0%	0	1	1.2%	98.8%
PAC	1248	1248	1222	97.9%	26	26	2.1%	97.9%

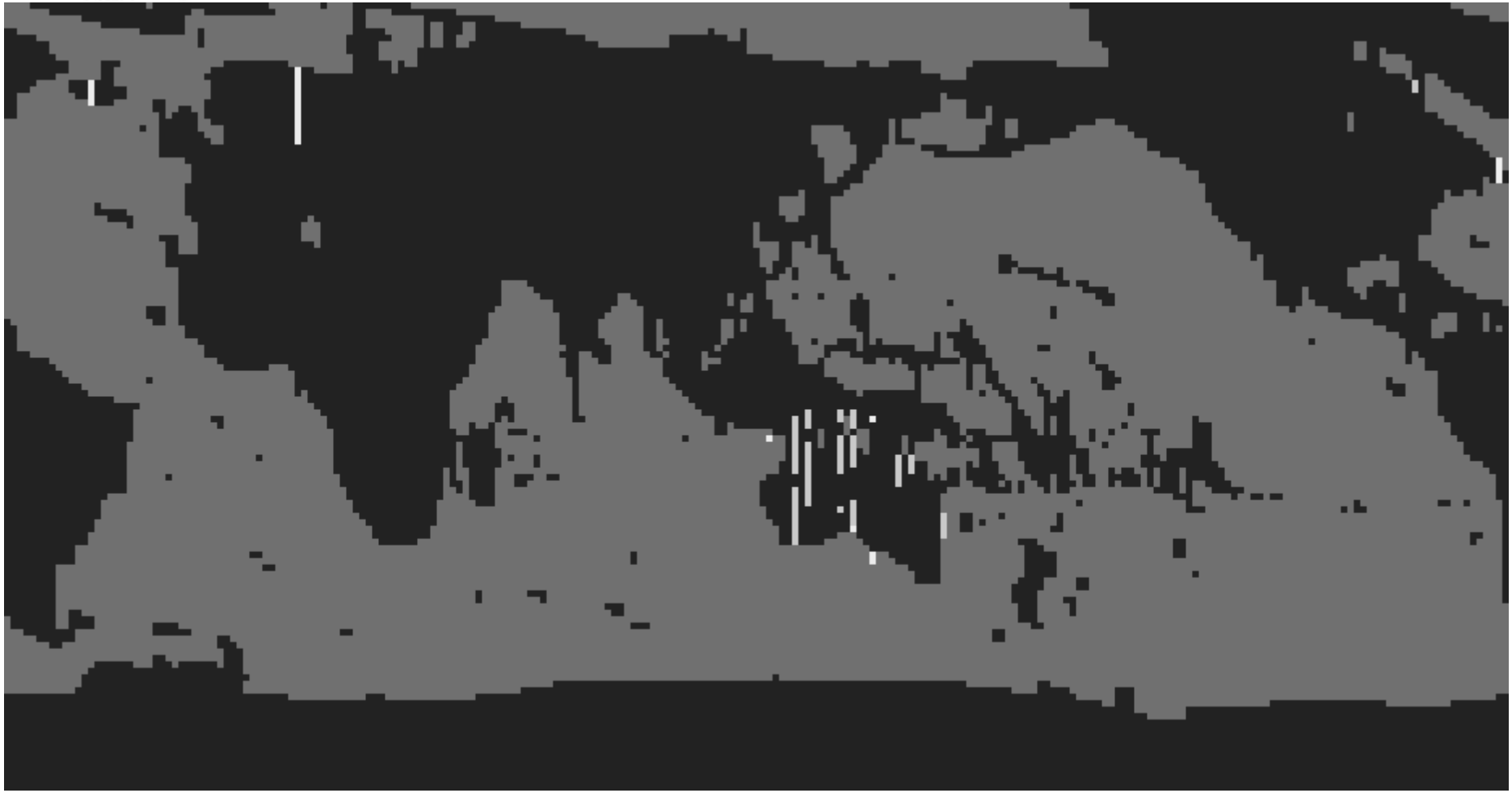
Summary Table Of Reject Reasons for ASA, COA, GNC, NSG

- **ASA**
  - **12 Exceeded ETM Long Term Duty Cycle**
  - **31 Exceeded ETM Mid Term Duty Cycle**
  - **2 Exceeded ETM Short Term Duty Cycle**
  - **160 Late request or Min gap set**
- **COA**
  - **1 Exceeded ETM Mid Term Duty Cycle**
  - **1 Exceeded ETM Short Term Duty Cycle**
  - **6 Late request or Min gap set**
- **GNC**
  - **8 Exceeded ETM Mid Term Duty Cycle**
  - **1 Exceeded ETM Short Term Duty Cycle**
  - **2 Late request or Min gap set**
- **NSG**
  - **12 Blocked by Universal Blocking event**
  - **16 Exceeded ETM Long Term Duty Cycle**

Summary Table Of Reject Reasons for CUB, FUI, HOA, KIS, PAC

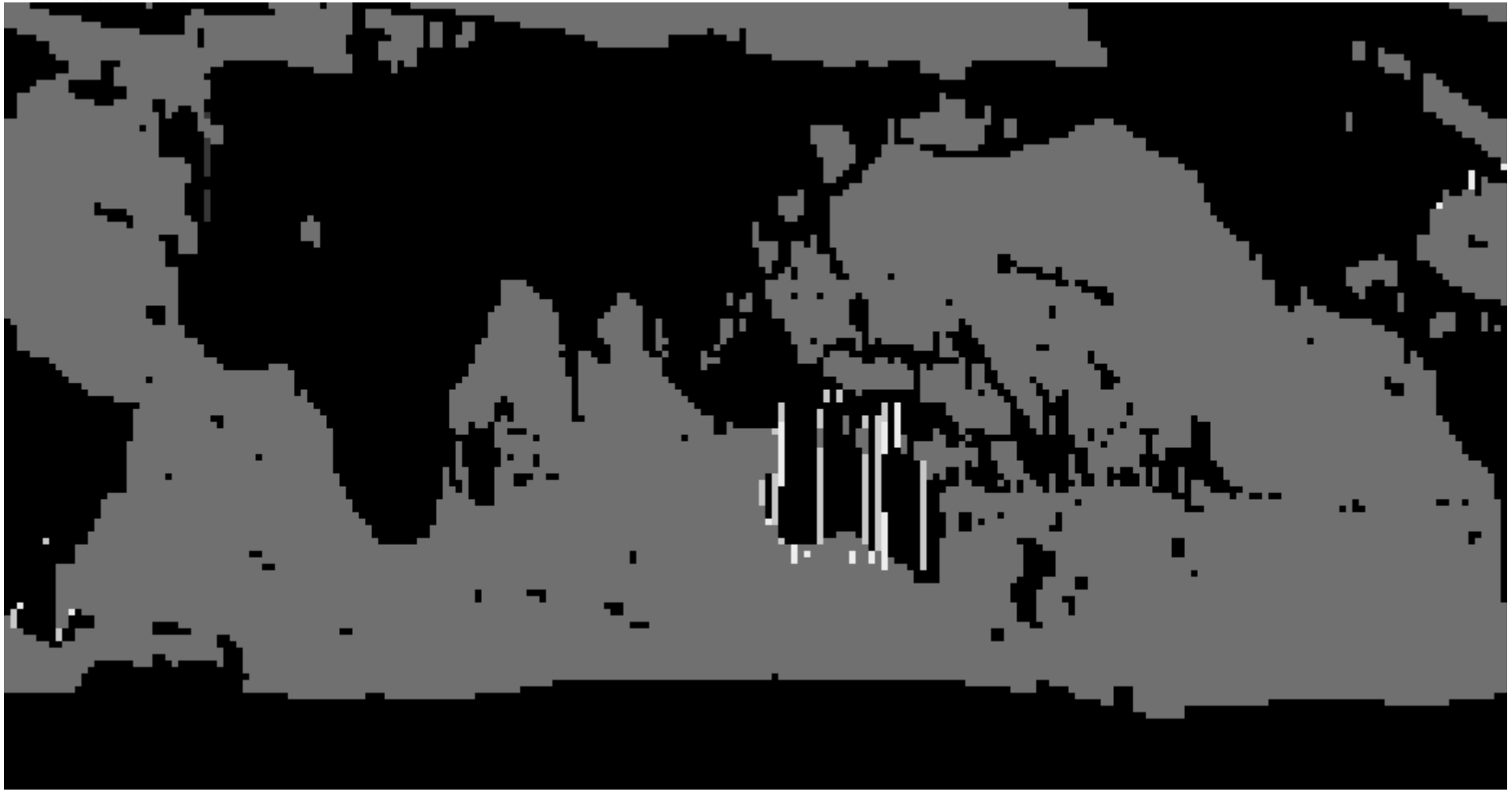
- **CUB**
  - **8 Exceeded ETM Mid Term Duty Cycle**
  - **30 Late request or Min gap set**
- **FUI**
  - **9 Blocked by Universal Blocking event**
  - **15 Exceeded ETM Long Term Duty Cycle**
  - **1 Late request or Min gap set**
  - **16 Antenna Conflict**
- **HOA**
  - **4 Exceeded ETM Long Term Duty Cycle**
  - **3 Exceeded ETM Mid Term Duty Cycle**
  - **1 Late request or Min gap set**
- **KIS**
  - **4 Blocked by Universal Blocking event**
  - **118 Exceeded ETM Long Term Duty Cycle**
  - **16 Exceeded ETM Mid Term Duty Cycle**
  - **30 Exceeded ETM Short Term Duty Cycle**
  - **33 Late request or Min gap set**
- **PAC**
  - **27 Exceeded ETM Mid Term Duty Cycle**
  - **15 Late request or Min gap set**

ASA, COA, GNC, NSG Rejections In Cycle 2



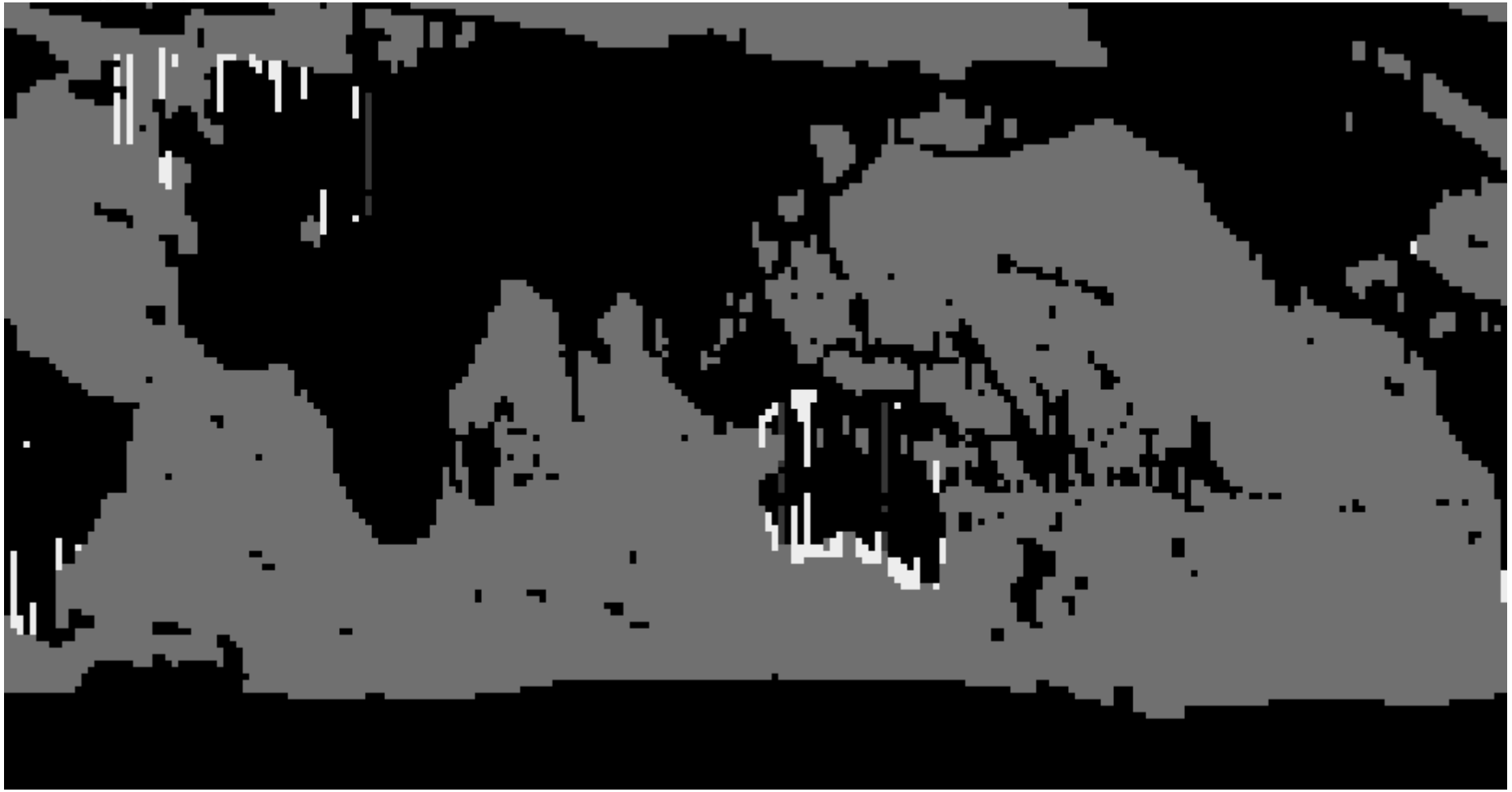
Blocked = Red, ETM+ Duty Cycle = Yellow, Antenna conflict = Purple,
Other passive: request too late, minimum gap = Light Blue

ASA, COA, GNC, NSG Rejections In Cycle 3



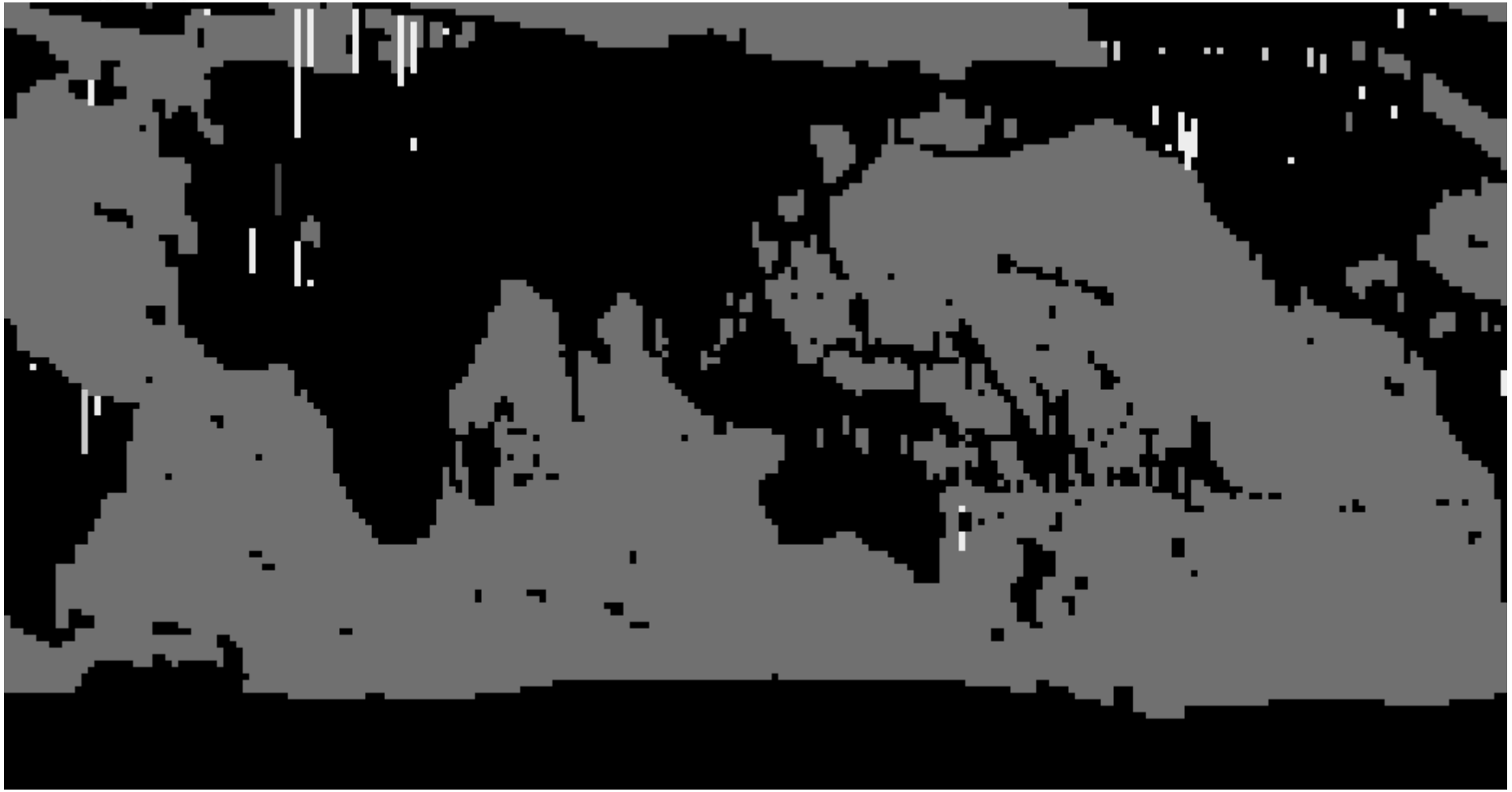
Blocked = Red, ETM+ Duty Cycle = Yellow, Antenna conflict = Purple,
Other passive: request too late, minimum gap = Light Blue

ASA, COA, GNC, NSG Rejections In Cycle 4



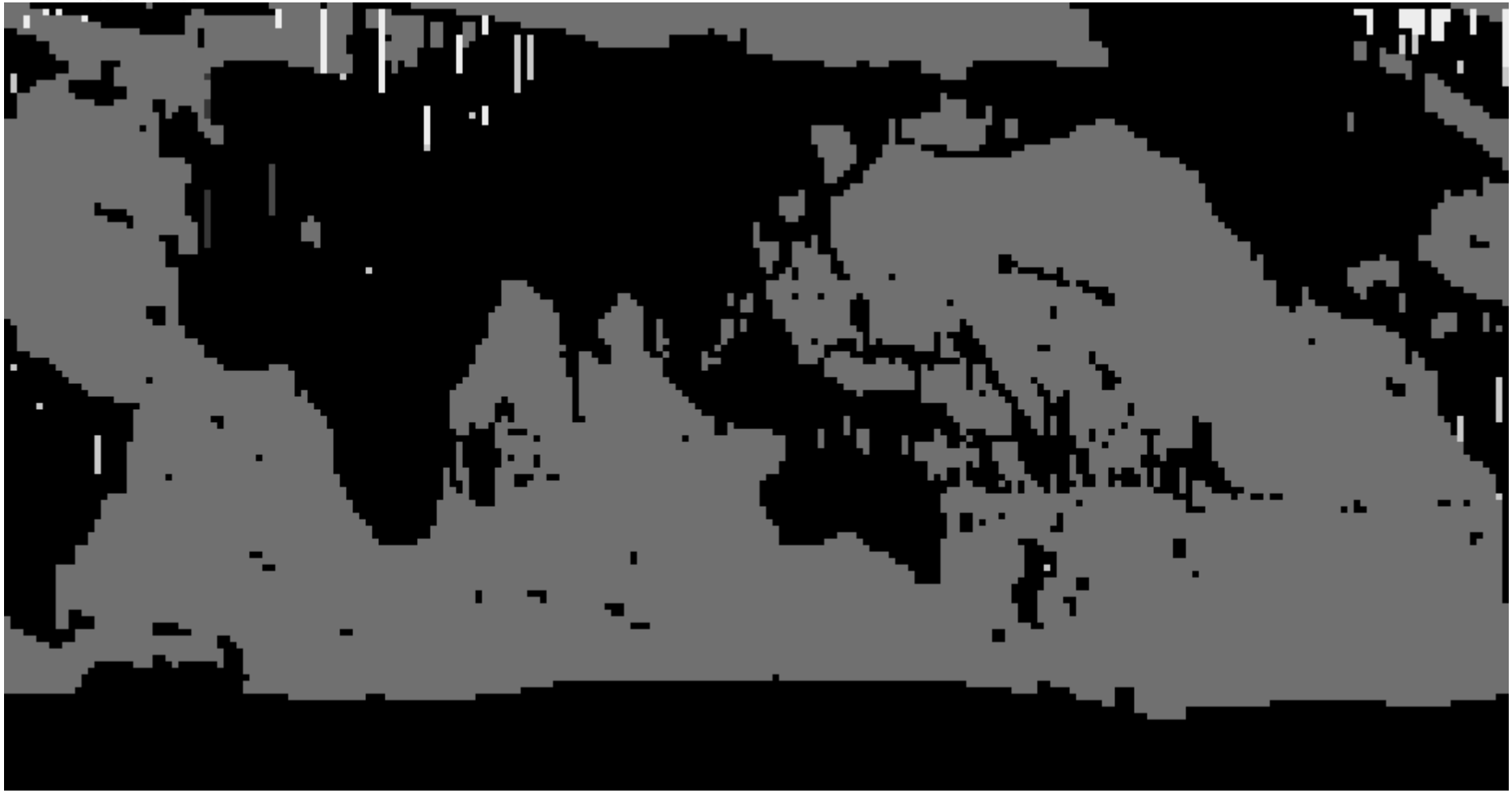
Blocked = Red, ETM+ Duty Cycle = Yellow, Antenna conflict = Purple,
Other passive: request too late, minimum gap = Light Blue

CUB, FUI, HOA, KIS, PAC Rejections In Cycle 2



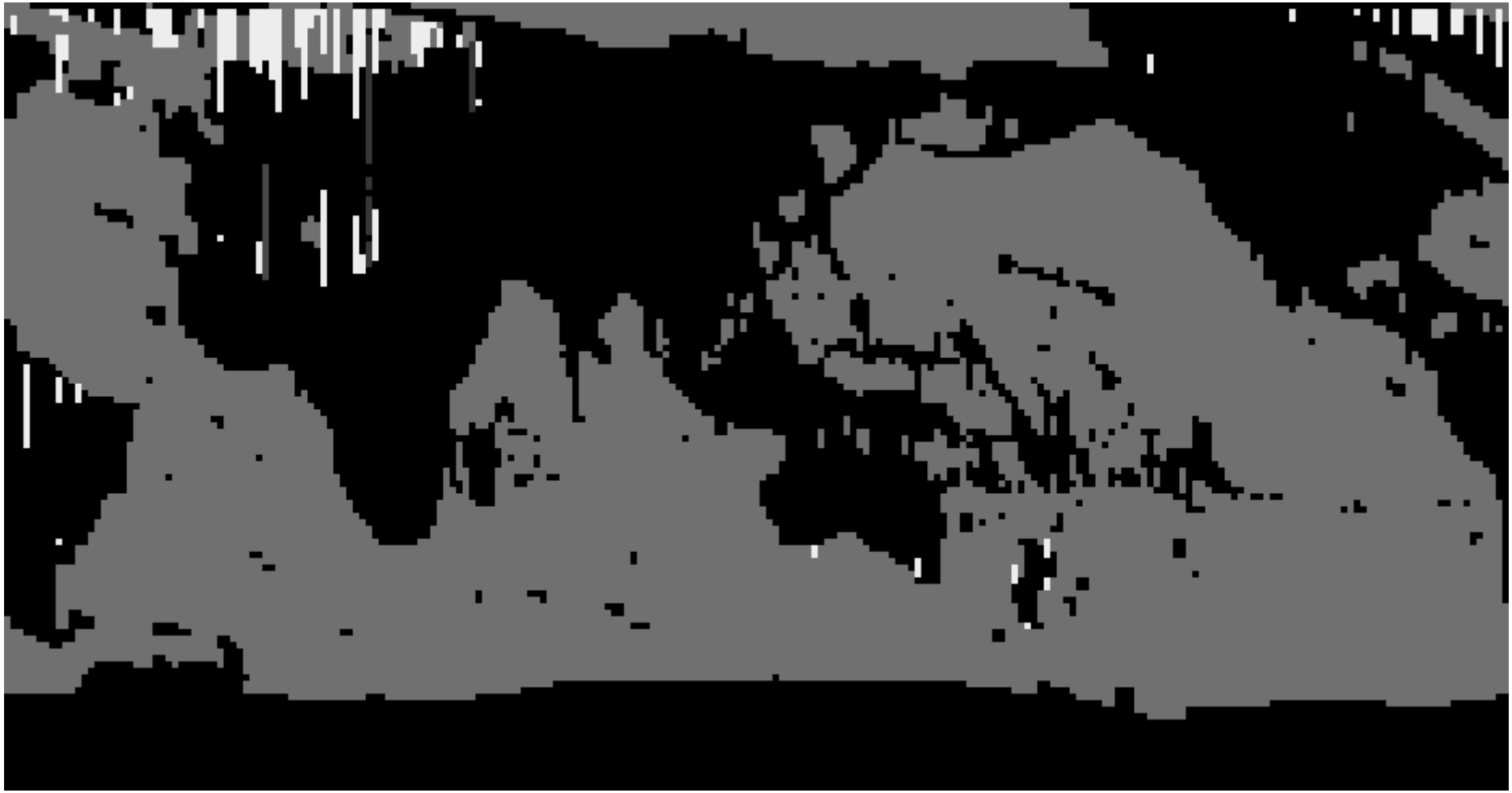
Blocked = Red, ETM+ Duty Cycle = Yellow, Antenna conflict = Purple,
Other passive: request too late, minimum gap = Light Blue

CUB, FUI, HOA, KIS, PAC
Rejections In Cycle 3



Blocked = Red, ETM+ Duty Cycle = Yellow, Antenna conflict = Purple,
Other passive: request too late, minimum gap = Light Blue

CUB, FUI, HOA, KIS, PAC
Rejections In Cycle 4



Blocked = Red, ETM+ Duty Cycle = Yellow, Antenna conflict = Purple,
Other passive: request too late, minimum gap = Light Blue

Policy On How Scheduler Uses Antenna Horizon Masks

- **SITUATION:**
  - **When we apply the masks, we end up with two sections in the station inview - essentially, two contacts**
  - **This violates rule of one contact/orbit per station**
  - **Planners must delete one or the other**
  - **This results in part of the IGS request being considered out of the acquisition circle and not schedulable**

- **POLICY:**
  - **We will set horizon to lowest point in mask**
  - **We will rely on each station to avoid requesting blocked scenes or to track through them**

Policy On Notifying Stations When Downlinks Are Cancelled

- **SITUATION:**
  - **A command problem or other problem will result in an IGS scheduled downlink not occurring**

- **POLICY:**
  - **We will put an ADMINISTRATIVE message in the affected station's outbox on the server**
  - **We will send an e-mail message to the station address given in the STATION DESCRIPTION message**
  - **We will telephone the station contact given in the STATION DESCRIPTION message**

Status of IGS Interfaces with MOC and DAAC

MOC I/F - Station Status

	ASA	BJC	BKT	COA	CUB	DKI	FUI	GNC	HAJ	HIJ	HOA	JSA	KIS	KUJ	MPS	NSG	PAC	UHI
ESTABLISHED	✓	✓	—	✓	✓	—	✓	✓	—	—	✓	—	✓	—	—	✓	✓	✓
TESTED	✓	✓	—	✓	✓	—	✓	✓	—	—	✓	—	✓	—	—	✓	✓	—
TEST DATA	✓	✓	—	✓	✓	—	✓	✓	—	—	✓	—	✓	—	—	✓	✓	—
OPERATIONAL DATA	✓	—	—	✓	✓	—	✓	✓	—	—	✓	—	✓	—	—	✓	✓	—
STATION LOCATION	✓	✓	—	✓	✓	—	✓	✓	—	✓	✓	—	✓	—	—	✓	✓	—

- **ESTABLISHED = password sent to station, ftp ‘ping’ has been performed**
- **TESTED = messages pulled successfully by station, messages sent successfully by station and passed validations**
- **TEST DATA = test downlinks scheduled and successfully received by the station**
- **OPERATIONAL DATA = routine downlinks scheduled and received**
- **STATION LOCATION = DESCRIPTION message received or email with final station location received**

Lessons Learned During MOC Testing And During Operations To Date

- **Follow ICD formats exactly**
  - **Do not include header or title information in the messages**
- **Remember to keep track of request expiration dates**
- **Remember to check for error messages after submitting requests**
- **To get acquisitions every opportunity, use “0” as the value for minimum gap**
  - **A value of “16” will result in the request being considered every second opportunity**

Readiness Of DAAC To Conduct Testing And Receive Operational Data

- **The software delivery that will process Product Delivery Records (PDRs) and metadata files is not yet in place at EDC**
  - **Delivery expected in October**
  - **Not expected to be operational until January 2000**
  - **No decision yet on what to do in the meantime**
- **Until delivery on 10/25, stations can conduct tests with the test bed system**
  - **Station sends in PDR and metadata files to server**
  - **Files are checked for format and validated**
  - **Email files are sent to station with PDRD and PAN messages**
  - **A second round of files exchanges can be conducted to verify any needed corrections were properly made**
- **Sample PDR and metadata file available by 9/17 for IGSs**

DAAC I/F - Station Status

	ASA	BJC	BKT	COA	CUB	DKI	FUI	GNC	HAJ	HIJ	HOA	JSA	KIS	KUJ	MPS	NSG	PAC	UHI
ESTABLISHED	—	—	—	—	—	—	✓	—	—	—	—	—	✓	—	—	✓	—	—
TESTED	—	—	—	—	—	—	✓	—	—	—	—	—	✓	—	—	✓	—	—
OPERATIONAL DATA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

- **ESTABLISHED = password sent to station, ftp 'ping' has been performed**
- **TESTED = email messages successfully received by station, files sent successfully by station and passed validations**
- **OPERATIONAL DATA = routine delivery of metadata [and browse] by stations and routine receipt of feedback from DAAC**

NOTES:

FUI/KIS/NSG - one round of testing has been performed; awaiting feedback on implementation of corrections

CUB - initial contact established via email; awaiting further word on station readiness to send PDR as well as metadata

Lessons Learned During DAAC Testing And During Operations To Date

- **Node name given in the ICD should have been identified as an example of node name, not the exact node name. Station will be provided with appropriate node name when testing arrangements are made.**

- **Each line in the PDR file should end in a semicolon**

- **Make sure that you follow the metadata format in the ICD exactly**

Status Of I/F Technical Documents

- **IGS ICD**
  - **Revision C issued in June 1999**
  - **Distributed at LTWG #7**
  - **Next update probably for exchange format, DAAC interface updates**
- **IGS OA**
  - **Review copy of Revision A distributed at LTWG #7**
  - **No comments received as yet**
- **DFCBs**
  - **Latest versions distributed at LTWG #7**
  - **No known updates in work now**
- **Other**
  - **IGS website has nominal gain file, presentation from LTWG #7, nominal cloud cover file**
  - **URL is http://ltpwww.gsfc.nasa.gov/IAS/htmls/igs.html**

Backup Charts

Negotiated ASA Request Circle

	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	
																																0
61						1	1	1	1	1	1	1	1	1	1	1																11
62						1	0	1	1	1	1	1	1	1	1	1	1	1	1	1												15
63				1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1									20
64			1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1									21
65			1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1									21
66		1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1									22
67		P	P	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1								21
68		P	P	P	P	0	1	0	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1							20
69		P	P	P	P	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0							20
70		P	P	P	P	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0							20
71		P	P	P	P	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							20
72		P	P	P	P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					22
73		P	P	P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					23
74		P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1			26
75		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		29
76		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1		29
77		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0		29
78		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0		29
79			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0		28
80			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		28
81				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		27
82					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		26
83					1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1		23
84					1	1	1	1	1	1	1							1	1	1	1	1	1	1	1	1	1	1	1			19
85																			1	1	1	1	1	1	1	1	1	1				11
86																						1	1	1	1	1	1	1				8
87																							1	1	1	1	1	1	0			7
88																									1	1	1	1	0			5
89																										1	1	1	1			4
90																										1	1	1	1			4
91																																0
																																0
	0	5	10	13	17	24	24	24	24	24	24	23	23	22	22	22	22	23	24	24	23	24	25	21	21	19	19	16	17	9	0	550

1 = archive scene 0 = flywheel scene P = PN data to breach gap vs 534

Orange = land Gray = water

Negotiated COA Request Circle

	4	3	2	1	233	232	231	230	229	228	227	226	225	224	223	222	221	220	219	218	217	
69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							15
70	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					17
71	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				18
72	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		20
73		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
74			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
75			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
76			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
77			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
78				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			16
79				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				15
80				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				15
81				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				15
82				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				15
83				1	1	1	1	1	1	1	1	1	1	1	1	1	1					14
84				1	1	1	1	1	1	1	1	1	1	1	1	1	1					14
85				1	1	1	1	1	1	1	1	1	1	1	1	1						13
86				1	1	1	1	1	1	1	1	1	1	1	1							12
87				1	1	1	1	1	1	1	1	1	1	1	1							12
88				1	1	1	1	1	1	1	1	1	1	1								11
89				1	1	1	1	1	1	1	1	1										9
90				1	1	1	1	1	1	1	1											8
91				1	1	1	1	1	1	1	1											8
92				1	1	1	1	1	1	1	1											8
93				1	1	1	1	1	1	1	1											8
94					1	1	1	1	1	1	1											7
95					1	1	1	1	1	1	1				1	1	1					10
96					1	1	1	1	1	1	1	1			1	1	1					11
97						1	1	1	1	1	1	1	1	1	1	1	1					12
98							1	1	1	1	1	1	1	1	1							9
99									1	1	1	1	1	1	1							7
	4	5	9	25	28	29	30	30	31	31	31	25	23	23	24	19	18	12	7	6	5	415

vs 415

1 = archive scene 0 = flywheel scene P = PN data to breach gap

Orange = land Gray = water

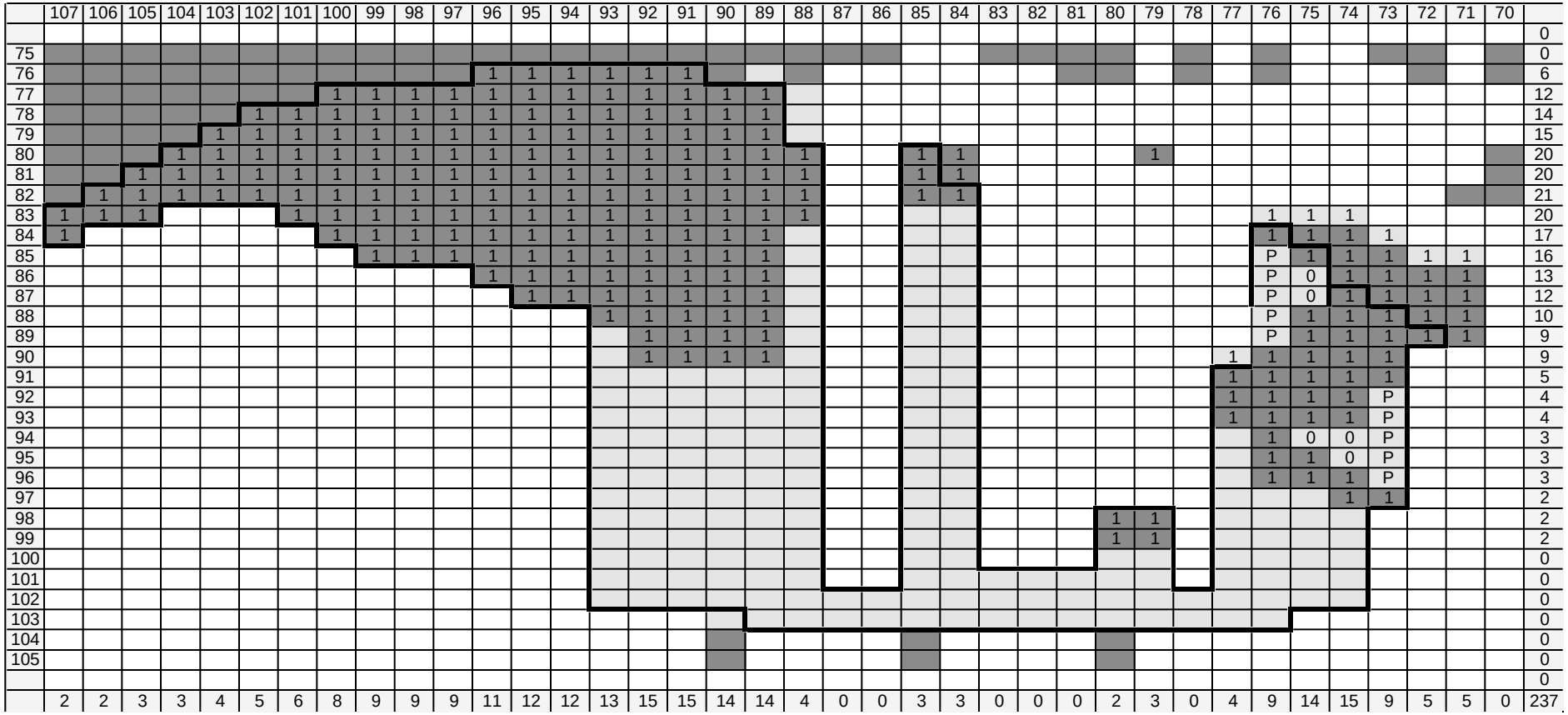
Negotiated CUB Request Circle

	9	8	7	6	5	4	3	2	1	233	232	231	230	229	228	227	226	225	224	223	222	221	220	219	218	217	216	215	214	
55									1	1	1	1																		4
56						1	1	1	1	1	1	1	1	1	1	1														11
57				1	1	1	1	1	1	1	1	1	1	1	1	1	1													14
58			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												16
59			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												16
60		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1										19
61	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1								22
62	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				26
63	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		28
64	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29
65	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29
66	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29
67	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	29
68		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		27
69			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		26
70			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		26
71				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		25
72						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		23
73								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		21
74								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		21
75									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		20
76									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			19
77									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					17
78									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							15
79									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							15
80									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							15
81									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1							15
82									1	1	1	1	1	1	1	1	1	1	1	1	1	1								14
83										1	1	1	1	1	1	1	1	1	1	1	1	1								13
84										1	1	1	1	1	1	1	1	1	1	1	1									12
85										1	1	1	1	1	1	1	1	1	1	1										11
86												1	1	1	1	1	1	1	1	1										9
87																1	1	1	1											4
88																														0
89																														0
90																														0
	7	9	13	15	15	17	17	19	28	31	31	32	31	31	31	32	31	30	28	27	24	23	20	16	16	15	14	13	4	605

1 = archive scene 0 = flywheel scene P = PN data to breach gap vs 501

Orange = land Gray = water

Negotiated HOA Request Circle



	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	
																																						0
75																																							0
76												1	1	1	1	1	1																						6
77								1	1	1	1	1	1	1	1	1	1	1	1																				12
78						1	1	1	1	1	1	1	1	1	1	1	1	1	1																				14
79					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1																				15
80				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1					1										20
81			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1															20
82		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1															21
83	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1												1	1	1					20
84	1							1	1	1	1	1	1	1	1	1	1	1	1													1	1	1	1				17
85									1	1	1	1	1	1	1	1	1	1	1													P	1	1	1	1	1		16
86												1	1	1	1	1	1	1	1													P	0	1	1	1	1		13
87													1	1	1	1	1	1	1													P	0	1	1	1	1		12
88															1	1	1	1	1													P	1	1	1	1	1		10
89																1	1	1	1													P	1	1	1	1	1		9
90																1	1	1	1												1	1	1	1	1				9
91																															1	1	1	1	1				5
92																															1	1	1	1	P				4
93																															1	1	1	1	P				4
94																																1	0	0	P				3
95																																1	1	0	P				3
96																																1	1	1	P				3
97																																		1	1				2
98																												1	1										2
99																												1	1										2
100																																							0
101																																							0
102																																							0
103																																							0
104																																							0
105																																							0
																																							0
	2	2	3	3	4	5	6	8	9	9	9	11	12	12	13	15	15	14	14	4	0	0	3	3	0	0	0	2	3	0	4	9	14	15	9	5	5	0	237

vs 387

1 = archive scene 0 = flywheel scene P = PN data to breach gap
Orange = land Gray = water